

PRELIMINARY DATA SUMMARY

September 1991

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD). In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Michael W. Leffler at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

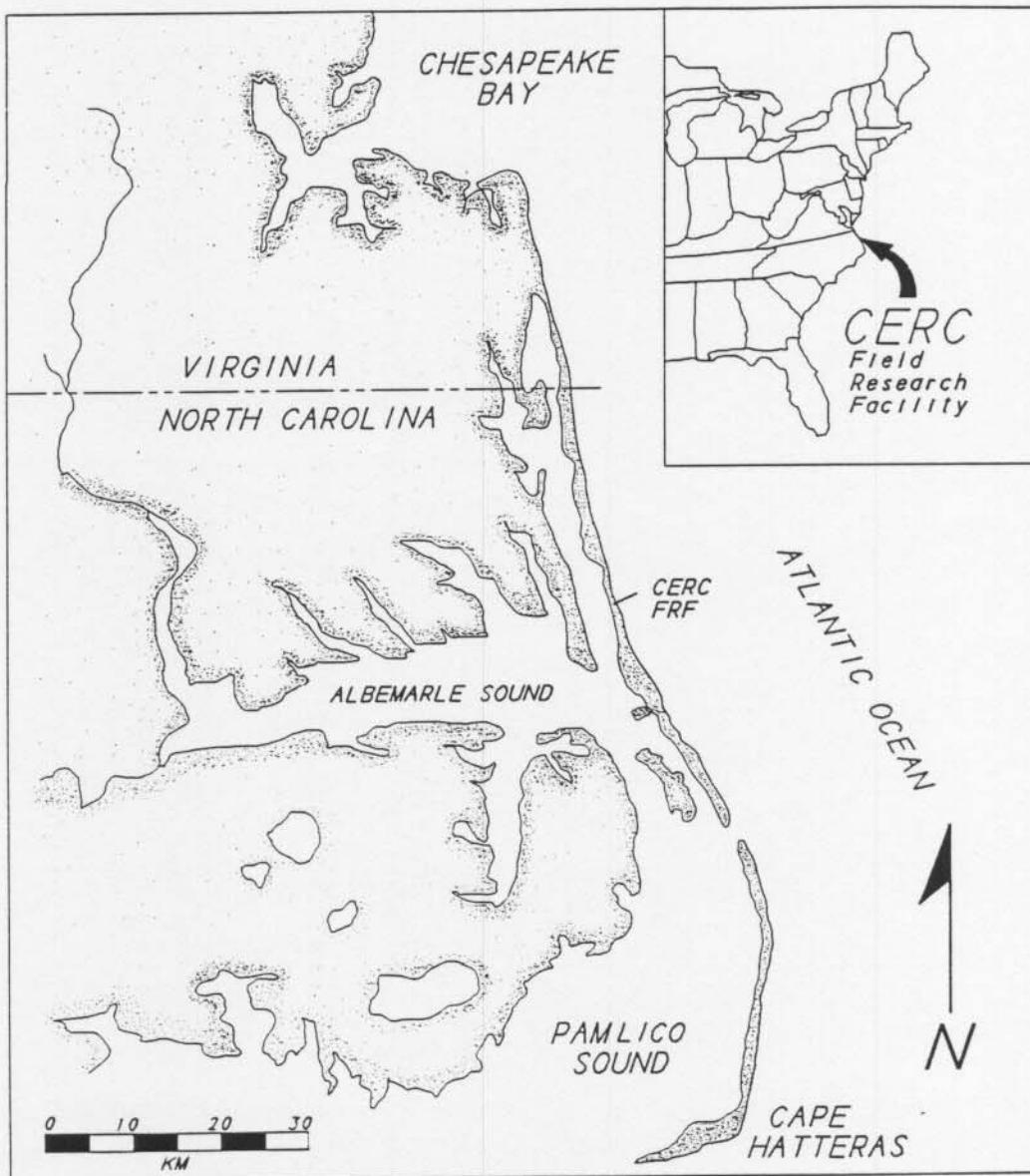


Figure 1. FRF Location Map

Table 1: Instrument Status/Data Availability

SEP 1991

Gage ID	Description/Remarks	Depth at Sensor		Day of the month																																	
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0				
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*			
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*		
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*		
932	Anemometer at seaward end of pier Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	
645	Baylor staff at station 7+80 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	
625	Baylor staff at station 18+60 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	
630	Waverider buoy 6.0 km offshore	Approx. 23 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	
519	Current meter 320 m north of FRF pier (0.9 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-
	Supplemental Observations (daily oceanographic and meteorological observations)		Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Gage Status	Daily Observation	Analog Record	Data Collected
Operational = *	Complete = *	Complete = *	All = *
Partial = /	Partial = /	Partial = /	Partial = /
Non-Operational = -	None = -	None = -	None = -

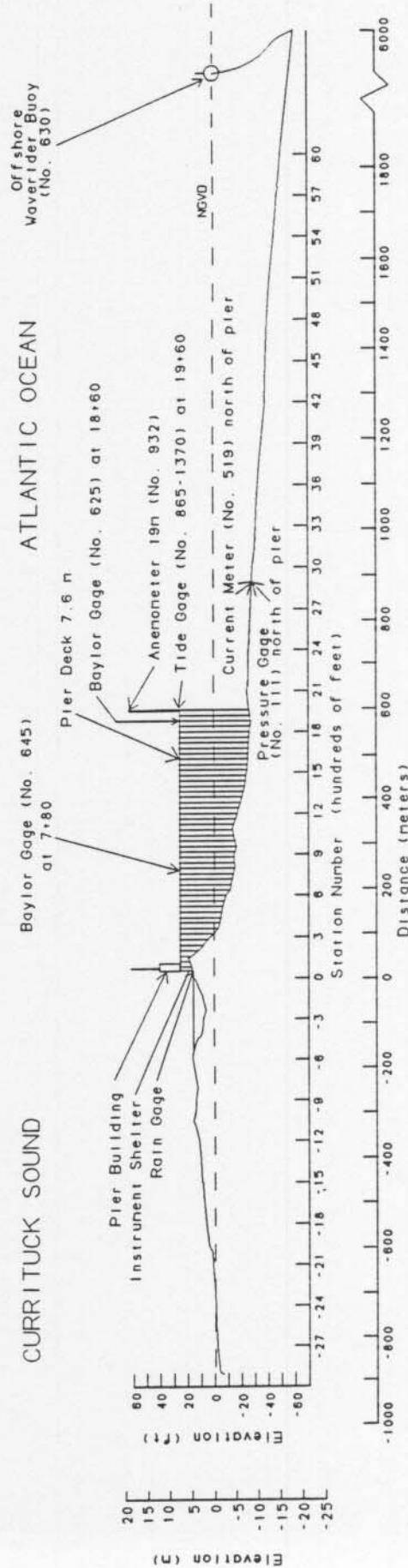
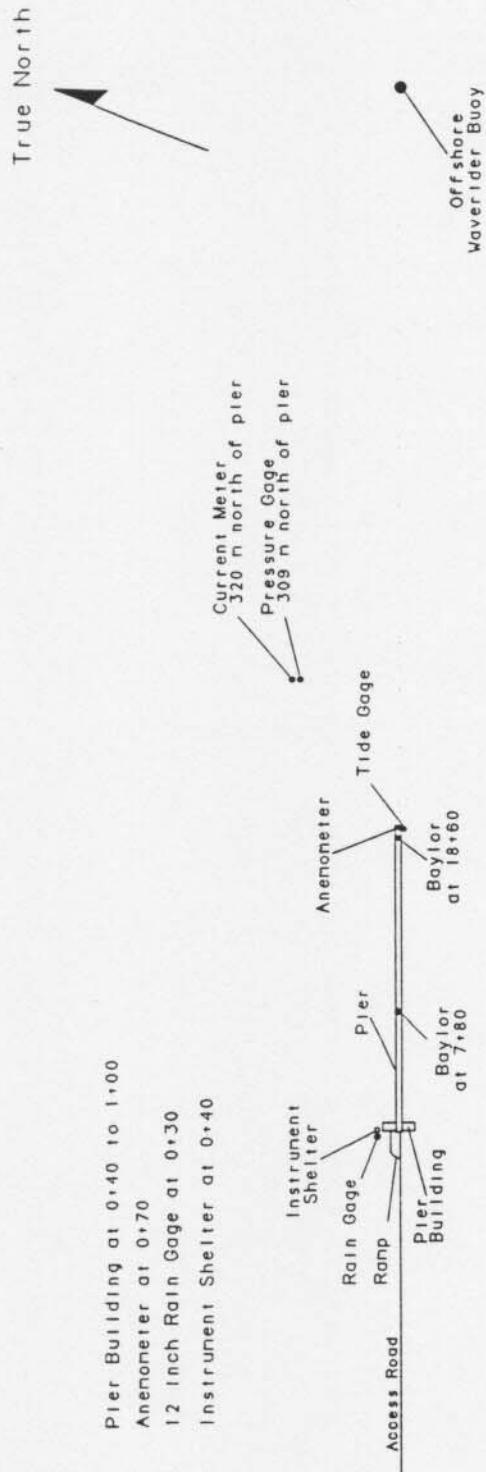


Figure 2. Instrument locations at FRF (all elevations from NGVD, all distances from FRF baseline).

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured at the end of the pier at an elevation of 19 m (Figure 2) using a Weather Measure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $mm \times .03937 = in.$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $mb \times 0.02953 = in. Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

Sep 1991

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
1	100	10	9	25.9	1011.8	0
	700	13	39	26.1	1014.2	0
	1300	15	38	25.0	1017.2	0
	1900	14	39	23.1	1019.9	0
2	100	12	50	24.3	1019.9	0
	700	10	81	25.1	1019.6	0
	1300	10	71	25.7	1020.9	0
	1900	8	61	24.6	1020.9	0
3	100	8	61	25.0	1021.6	0
	700	6	84	26.4	1021.6	0
	1300	5	91	28.5	1023.0	0
	1900	6	103	26.0	1020.3	0
4	100	3	163	24.9	1018.9	0
	700	4	131	27.0	1017.9	0
	1300	4	122	28.7	1016.2	0
	1900	6	182	27.1	1014.8	0
5	100	3	228	26.4	1014.5	0
	700	5	237	26.2	1015.2	0
	1300	5	241	30.9	1015.5	0
	1900	1	284	26.6	1015.9	0
6	100	1	1	26.7	1016.9	0
	700	2	316	26.5	1017.2	0
	1300	3	46	27.6	1018.6	0
	1900	5	79	26.5	1018.2	0
7	100	6	71	26.0	1018.9	0
	700	7	47	26.0	1020.9	0
	1300	6	32	27.2	1021.3	0
	1900	8	47	25.5	1020.9	0
8	100	7	39	25.2	1020.6	0
	700	8	36	26.0	1021.9	0
	1300	8	27	27.6	1021.6	0
	1900	4	44	26.0	1021.6	0
9	100	4	37	25.7	1021.6	0
	700	4	46	26.5	1022.3	0
	1300	4	31	28.4	1022.3	0
	1900	3	76	25.7	1021.3	0
10	100	3	174	24.5	1020.6	0
	700	0		27.2	1021.3	0
	1300	5	125	29.3	1018.9	0
	1900	6	187	27.1	1016.5	0
11	100	7	236	26.6	1015.5	0
	700	5	235	26.4	1013.8	0
	1300	3	238	30.8	1012.1	0
	1900	2	104	27.8	1012.1	0
12	100	3	87	27.2	1012.5	0
	700	7	53	26.5	1014.2	0
	1300	7	21	27.1	1014.8	0
	1900	6	72	25.3	1014.5	0
13	100	4	73	24.9	1015.2	0
	700	3	56	25.2	1015.9	0
	1300	3	72	26.8	1015.9	0
	1900	6	135	24.9	1014.8	0
14	100	3	184	24.7	1014.5	0
	700	5	202	26.9	1013.8	0
	1300	5	243	30.9	1012.8	0
	1900	5	35	27.2	1014.2	0
15	100	6	51	26.6	1015.5	0
	700	4	50	27.0	1017.2	0
	1300	5	123	29.6	1018.2	0
	1900	5	152	27.5	1018.2	0
16	100	4	179	26.1	1017.9	0
	700	3	221	27.5	1018.9	0
	1300	6	143	30.9	1018.6	0
	1900	7	199	28.5	1017.5	0

* electronic problems

(Continued)

Table 2: Meteorological Data

Sep 1991

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
17	100	6	216	27.3	1016.9	0
	700	6	231	27.5	1017.5	0
	1300	5	203	32.0	1015.9	0
	1900	8	197	28.6	1015.5	0
18	100	5	214	27.9	1016.5	0
	700	4	219	27.9	1017.5	0
	1300	*	*	*	*	0
	1900	7	178	28.7	1015.9	0
19	100	5	200	28.0	1016.2	0
	700	5	214	28.2	1016.5	0
	1300	4	218	31.7	1014.5	0
	1900	3	243	28.5	1014.2	0
20	100	15	359	22.1	1015.9	0
	700	15	1	21.0	1017.2	0
	1300	14	11	20.9	1018.2	0
	1900	12	10	21.6	1018.9	0
21	100	11	31	21.4	1019.2	0
	700	10	30	21.9	1020.9	0
	1300	9	18	22.9	1022.3	0
	1900	8	37	21.0	1023.0	0
22	100	7	54	21.0	1024.0	0
	700	7	53	21.7	1025.0	0
	1300	6	47	23.4	1024.7	0
	1900	6	63	23.2	1023.0	0
23	100	6	92	24.5	1021.6	0
	700	0		24.7	1021.3	0
	1300	2	134	26.5	1020.3	0
	1900	6	171	24.6	1020.6	0
24	100	4	196	24.9	1019.9	0
	700	5	12	24.7	1019.6	0
	1300	7	103	25.7	1016.9	0
	1900	7	132	25.8	1013.1	0
25	100	9	199	26.0	1008.1	0
	700	6	226	26.6	1006.0	0
	1300	6	231	30.0	1005.0	0
	1900	6	208	27.8	1003.7	0
26	100	7	198	30.3	1002.0	0
	700	3	247	26.4	1001.6	7
	1300	5	325	23.2	1004.7	0
	1900	2	84	23.1	1007.4	0
27	100	3	260	21.9	1009.8	0
	700	10	26	22.7	1012.8	0
	1300	9	15	23.0	1015.2	0
	1900	6	35	21.4	1016.5	0
28	100	7	31	21.6	1018.2	0
	700	7	42	22.4	1020.9	0
	1300	5	51	23.3	1023.6	0
	1900	5	80	21.9	1024.7	0
29	100	4	97	21.8	1026.0	0
	700	3	79	23.3	1027.4	0
	1300	4	131	25.3	1026.3	0
	1900	6	153	23.5	1025.0	0
30	100	4	199	22.0	1025.3	0
	700	3	279	22.8	1026.0	0
	1300	5	27	25.1	1024.7	0
	1900	3	57	23.1	1024.3	0
		Resultant 2	64	Mean 25.8	Mean 1017.6	Total 7

* electronic problems

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hr (more frequently during storms) beginning at 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for four contiguous 34-min records.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

Table 3: Wave Data

Sep 1991

Day	Hour	645		625		111		630	
		Baylor at 7+80	Hmo.m T.sec	Baylor at 18+60	Hmo.m T.sec	Pressure Gage	T.sec	Offshr Wvrdr	Hmo.m T.sec
1	0100	0.37	10.67	0.50	10.67	0.41	10.24	0.53	10.67
	0700	1.00	4.92	1.42	4.83	1.49	4.49	1.35	5.02
	1300	1.47	7.53	2.33	7.53	2.42	7.31	2.62	7.53
	1900	1.00	7.76	2.36	6.74	2.51	7.31	2.35	6.92
2	0100	1.20	7.53	2.10	6.74	2.07	6.09	2.21	7.53
	0700	1.11	7.31	1.88	6.56	1.82	7.31	1.96	6.40
	1300	1.34	6.92	1.74	6.92	1.65	7.11	1.81	6.74
	1900	0.94	9.48	1.58	9.48	1.52	9.14	1.63	9.48
3	0100	1.22	9.48	1.48	9.48	1.47	8.53	1.50	6.24
	0700	0.74	8.53	1.22	9.14	1.14	8.53	1.13	8.83
	1300	0.76	6.40	1.17	8.26	1.04	8.26	1.17	7.11
	1900	0.53	6.92	0.96	7.11	0.93	7.53	1.00	8.26
4	0100	0.66	7.53	0.96	6.92	0.92	7.53	1.03	6.74
	0700	0.48	7.11	0.92	7.53	0.86	6.74	1.06	8.53
	1300	0.61	7.31	0.86	8.00	0.87	8.00	1.00	7.53
	1900	0.42	7.76	0.77	7.31	0.77	7.76	0.87	8.00
5	0100	0.37	7.31	0.75	7.31	0.70	6.74	0.83	7.31
	0700	0.30	7.31	0.67	7.11	0.67	7.53	0.81	7.31
	1300	0.36	7.31	0.69	7.11	0.70	7.76	0.85	8.26
	1900	0.41	8.26	0.65	8.26	0.67	8.00	0.80	8.00
6	0100	0.27	7.53	0.64	8.00	0.62	8.26	0.72	7.76
	0700	0.37	8.26	0.70	8.83	0.63	8.83	0.76	9.14
	1300	0.33	8.83	0.71	8.83	0.75	8.53	0.86	8.53
	1900	0.54	10.24	0.93	9.85	0.80	9.85	0.85	9.48
7	0100	0.63	8.83	1.07	9.85	1.02	9.48	1.08	8.83
	0700	0.72	3.61	1.04	8.83	0.92	8.83	1.00	8.83
	1300	0.67	4.92	1.06	9.85	1.00	9.14	1.03	9.85
	1900	0.80	4.92	1.09	9.48	1.06	9.48	1.14	8.53
8	0100	0.76	4.74	1.09	9.48	1.02	8.83	1.18	5.22
	0700	0.82	4.83	1.12	4.92	1.01	9.48	1.15	9.48
	1300	0.73	4.66	1.10	9.14	1.01	8.26	1.15	8.00
	1900	0.72	8.53	1.16	8.26	1.14	8.53	1.21	8.26
9	0100	0.66	8.53	1.13	8.53	1.09	8.53	1.12	8.00
	0700	0.75	7.53	1.21	7.31	1.17	8.00	1.19	8.53
	1300	0.61	12.19	1.12	10.24	1.04	11.64	1.11	11.13
	1900	0.73	9.85	1.06	9.85	0.97	9.48	1.13	10.24
10	0100	0.58	9.48	0.90	9.85	0.87	9.48	0.93	9.85
	0700	0.55	11.13	0.81	8.00	0.83	10.67	0.95	10.24
	1300	0.42	9.48	0.78	9.48	0.71	10.67	0.77	10.67
	1900	0.50	8.83	0.74	8.26	0.67	9.14	0.80	9.85
11	0100	0.33	9.14	0.62	8.26	0.58	8.26	0.69	8.83
	0700	0.35	9.48	0.56	9.85	0.50	9.85	0.61	9.48
	1300	0.18	9.85	0.49	9.85	0.46	9.14	0.52	10.24
	1900	0.35	10.24	0.51	9.85	0.45	9.85	0.55	9.48
12	0100	0.16	10.67	0.40	9.85	0.42	9.48	0.49	10.24
	0700	0.62	3.24	0.72	8.83	0.55	8.83	0.71	8.83
	1300	0.59	3.82	0.71	10.67	0.60	11.13	0.72	11.13
	1900	0.63	4.74	0.80	10.24	0.71	9.85	0.86	10.24
13	0100	0.62	5.69	0.70	9.85	0.65	10.24	0.76	5.69
	0700	0.57	6.09	0.68	5.95	0.65	5.95	0.77	6.09
	1300	0.50	5.33	0.62	9.48	0.59	9.48	0.62	9.48
	1900	0.30	2.48	0.62	9.85	0.49	8.53	0.61	8.83
14	0100	0.38	9.48	0.51	8.83	0.45	9.48	0.54	8.83
	0700	0.17	12.19	0.50	12.19	0.48	12.19	0.50	12.19
	1300	0.29	12.19	0.48	12.19	0.46	11.64	0.49	11.64
	1900	0.24	11.64	0.60	11.64	0.53	11.64	0.56	11.64
15	0100	0.62	11.13	0.81	11.13	0.74	11.13	0.80	11.13
	0700	0.46	10.67	0.88	10.24	0.76	10.67	0.92	10.24
	1300	0.57	10.24	0.84	10.67	0.76	9.85	0.84	9.48
	1900	0.35	9.85	0.71	9.48	0.69	9.48	0.74	9.48
16	0100	0.53	9.48	0.75	9.48	0.73	8.53	0.83	9.14
	0700	0.35	8.83	0.79	9.14	0.80	8.83	0.87	9.14
	1300	0.56	8.83	0.84	8.00	0.81	7.11	0.86	8.53
	1900	0.36	7.31	0.70	8.00	0.66	8.53	0.79	8.53

* Electronic problems

(Continued)

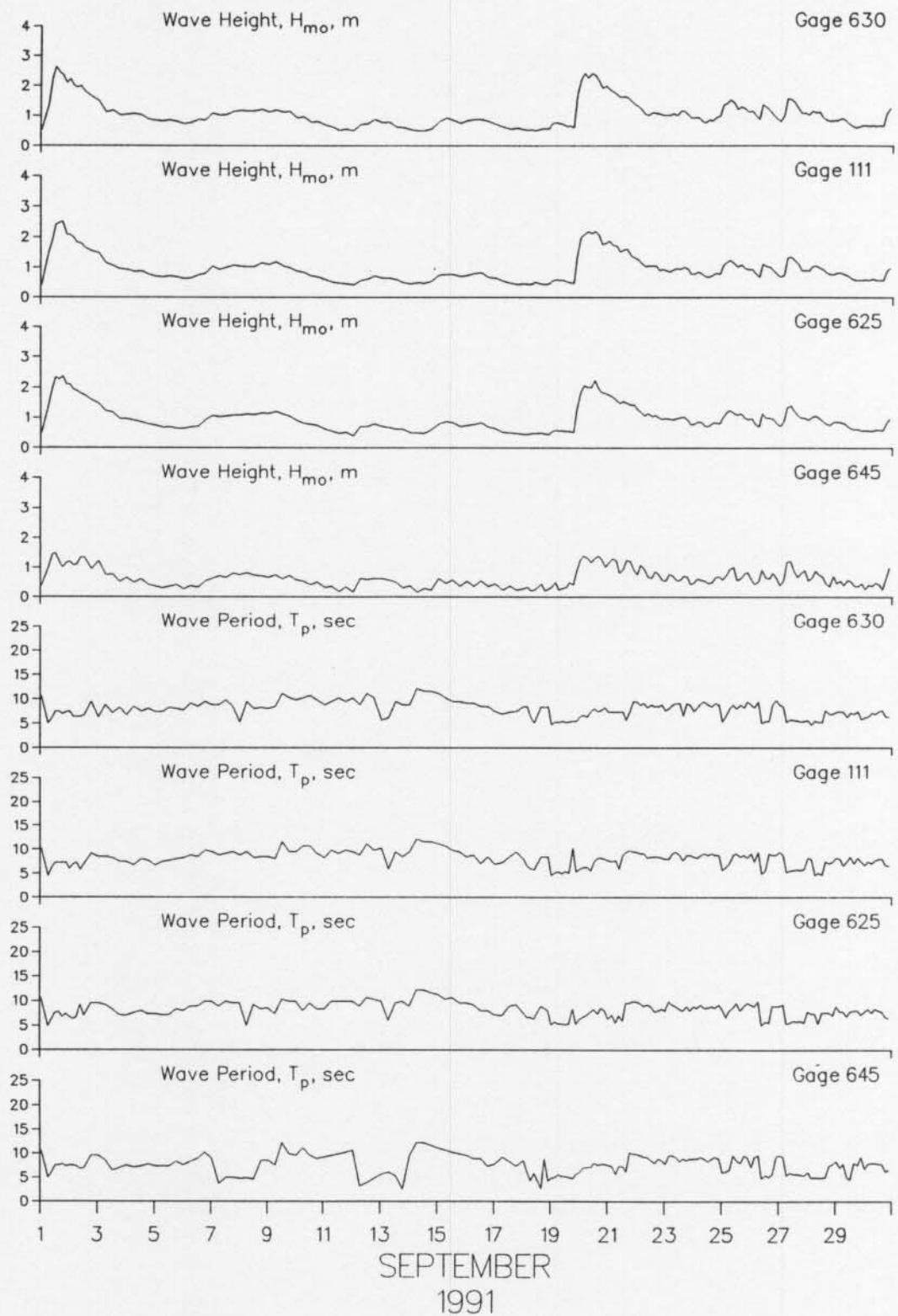
Table 3: Wave Data

Sep 1991

Day	Hour	645		625		111		630	
		Baylor at 7+80	Hmo.m T.sec	Baylor at 18+60	Hmo.m T.sec	Pressure Gage	Hmo.m T.sec	Offshrd Wvrdr	Hmo.m T.sec
17	0100	0.44	7.76	0.64	7.11	0.63	6.92	0.70	7.53
	0700	0.24	9.14	0.52	6.92	0.54	7.31	0.62	6.92
	1300	0.38	8.26	0.50	8.83	0.46	8.53	0.54	7.31
	1900	0.24	7.31	0.48	9.14	0.43	9.48	0.58	7.53
18	0100	0.29	8.53	0.45	7.53	0.44	8.00	0.54	8.53
	0700	0.21	4.34	0.49	6.56	0.43	6.09	0.53	6.40
	1300								
	1900	0.22	8.83	0.47	8.53	0.43	8.53	0.56	8.26
19	0100	0.34	4.83	0.55	5.02	0.55	4.57	0.74	4.74
	0700	0.24	5.57	0.58	5.33	0.57	5.33	0.75	5.22
	1300	0.33	5.22	0.56	5.22	0.52	5.45	0.64	5.22
	1900	0.42	4.74	0.51	8.26	0.47	10.24	0.60	5.45
20	0100	1.27	6.09	1.84	6.24	1.99	6.09	2.19	6.40
	0700	1.32	7.11	2.01	7.11	2.19	6.40	2.25	6.40
	1300	1.31	8.00	2.24	8.26	2.18	7.53	2.34	8.00
	1900	1.29	7.76	1.83	8.53	1.76	8.26	1.92	7.76
21	0100	1.15	7.53	1.77	6.24	1.86	7.76	1.88	7.31
	0700	1.23	5.69	1.58	5.57	1.70	7.76	1.71	7.31
	1300	0.94	7.31	1.54	5.95	1.58	8.83	1.64	7.31
	1900	1.21	10.24	1.45	9.48	1.38	9.85	1.49	7.53
22	0100	0.76	9.85	1.27	9.85	1.26	9.48	1.31	9.48
	0700	0.95	9.14	1.08	8.83	1.02	9.14	1.05	9.14
	1300	0.65	8.53	1.06	8.83	1.05	8.53	1.10	8.83
	1900	0.77	8.83	1.00	8.00	0.91	8.53	1.07	8.53
23	0100	0.56	7.76	0.99	8.00	0.89	8.00	1.01	7.76
	0700	0.73	9.48	0.94	9.14	0.92	9.14	1.06	8.83
	1300	0.57	8.26	1.01	8.26	0.94	8.83	1.15	9.14
	1900	0.70	8.53	0.95	8.83	0.93	8.83	1.02	9.14
24	0100	0.51	8.83	0.80	8.83	0.79	8.53	0.92	7.53
	0700	0.57	9.14	0.85	9.14	0.78	8.83	0.81	9.14
	1300	0.46	8.26	0.73	8.53	0.68	8.83	0.86	8.83
	1900	0.68	9.14	0.84	8.53	0.79	8.83	0.93	9.14
25	0100	0.59	5.95	1.02	8.26	1.07	5.69	1.35	5.33
	0700	0.95	6.56	1.24	8.00	1.24	7.11	1.52	8.00
	1300	0.57	8.53	1.11	9.48	1.02	9.14	1.20	8.00
	1900	0.81	9.48	1.00	8.83	0.96	8.83	1.22	8.26
26	0100	0.57	7.11	0.97	9.14	0.93	9.14	1.15	8.83
	0700	0.53	9.48	0.71	9.85	0.67	9.48	0.88	9.48
	1300	0.66	5.45	0.99	5.69	1.03	5.57	1.28	5.45
	1900	0.81	5.69	0.97	8.83	0.88	8.83	1.00	8.83
27	0100	0.40	9.48	0.74	8.83	0.68	9.48	0.80	8.83
	0700	1.20	5.45	1.35	5.33	1.32	5.22	1.56	5.22
	1300	0.90	5.69	1.23	5.82	1.23	5.69	1.44	5.69
	1900	0.81	5.57	0.99	5.82	0.90	5.69	1.08	5.33
28	0100	0.56	6.09	0.93	7.76	0.88	8.26	1.03	5.57
	0700	0.89	5.02	1.06	7.31	1.04	4.66	1.11	5.57
	1300	0.70	4.83	0.90	7.53	0.93	4.74	0.93	5.22
	1900	0.36	7.31	0.77	7.53	0.76	7.11	0.81	6.92
29	0100	0.47	8.26	0.87	8.83	0.82	8.26	0.84	7.31
	0700	0.39	7.76	0.82	7.76	0.76	6.56	0.86	7.31
	1300	0.53	4.49	0.64	7.76	0.61	8.53	0.67	7.11
	1900	0.37	7.53	0.63	8.00	0.57	8.26	0.62	7.53
30	0100	0.28	6.74	0.59	7.76	0.58	6.74	0.67	6.24
	0700	0.37	8.00	0.57	7.53	0.62	7.11	0.68	7.11
	1300	0.44	7.76	0.61	8.00	0.57	8.00	0.67	7.53
	1900	0.65	6.24	0.84	6.56	0.90	6.74	1.10	6.40
Mean		0.62	7.71	0.95	8.32	0.92	8.32	1.03	8.11
Std dev		0.30	2.03	0.42	1.52	0.44	1.58	0.44	1.63

* Electronic problems

(Sheet 2 of 2)



SEPTEMBER
1991

PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

Table 4: Current Data
Sep 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
1 0100-Along Cross Result										7	S
1 0700-Along Cross Result	61 24 66	S on 182		55 0 55	S 0 160			53	S	31 9 32	S off 144
1 1300-Along Cross Result										50 18 53	S off 140
1 1900-Along Cross Result										42 17 45	S off 138
2 0100-Along Cross Result										37 12 39	S off 142
2 0700-Along Cross Result	20 0 20	S on 160		41 0 41	S 0 160			41	S	27 6 28	S off 147
2 1300-Along Cross Result										20 6 21	S off 143
2 1900-Along Cross Result										28 11 30	S off 139
3 0100-Along Cross Result										26 6 27	S off 147
3 0700-Along Cross Result	14 0 14	S on 160		30 0 30	N 0 340			12	N	16 8 18	S off 133
3 1300-Along Cross Result										16 5 17	S off 143
3 1900-Along Cross Result										10 7 12	S off 125
4 0100-Along Cross Result										3 3 4	N on 295
4 0700-Along Cross Result	29 0 29	N on 340		55 0 55	N 0 340			18	N	10 4 11	N on 318
4 1300-Along Cross Result										18 5 19	N on 324
4 1900-Along Cross Result										10 5 11	N on 313
5 0100-Along Cross Result										14 7 16	N on 313
5 0700-Along Cross Result	10 10 13	N off 25		34 0 34	N 0 340			18	N	5 3 6	N on 309
5 1300-Along Cross Result										14 6 15	N on 317
5 1900-Along Cross Result										6 1 6	N off 349

KEY = All speeds in cm/sec

N = Northward, Shore parallel

S = Southward, Shore parallel

on = onshore off = offshore

Table 4: Current Data (Continued)
Sep 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements				Current Meter	
	Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye Zone (surface)	12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519
6 0100-Along Cross Result										8 2 8
6 0700-Along Cross Result	15 0 15	S 0 160			23 0 23	N 0 340	South	13	N	4 5 6
6 1300-Along Cross Result										3 0 3
6 1900-Along Cross Result										1 0 1
7 0100-Along Cross Result										11 0 11
7 0700-Along Cross Result	23 4 24	S on 169			23 0 23	S 0 160	North	28	S	16 9 18
7 1300-Along Cross Result										20 20 28
7 1900-Along Cross Result										25 10 27
8 0100-Along Cross Result										27 10 29
8 0700-Along Cross Result	44 7 44	S on 169			38 6 39	S off 151	North	24	S	19 13 23
8 1300-Along Cross Result										17 9 19
8 1900-Along Cross Result										9 3 9
9 0100-Along Cross Result										15 6 16
9 0700-Along Cross Result	44 0 44	S 0 160			22 4 22	N on 329	South	41	N	13 5 14
9 1300-Along Cross Result										13 10 16
9 1900-Along Cross Result										8 5 9
10 0100-Along Cross Result										6 0 6
10 0700-Along Cross Result	8 2 9	S on 174			14 4 15	N off 354	South	14	N	9 3 9
10 1300-Along Cross Result										7 2 7
10 1900-Along Cross Result										20 9 22

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Continued)
Sep 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
11 0100-Along Cross Result										8	N
										5	on
										9	308
11 0700-Along Cross Result	17	N			177	7	N		1	17	N
	13	off				4	off			8	on
	21	17				9	11			19	315
11 1300-Along Cross Result										9	N
										3	on
										9	322
11 1900-Along Cross Result										10	N
										1	off
										10	346
12 0100-Along Cross Result										6	N
										1	off
										6	349
12 0700-Along Cross Result	0					18	S		21	11	N
	6	on			165	0				3	off
	6	250				18	160			11	355
12 1300-Along Cross Result										0	
										7	off
										7	70
12 1900-Along Cross Result										0	
										1	off
										1	70
13 0100-Along Cross Result										7	S
										6	off
										9	119
13 0700-Along Cross Result	41	S			152	6	S		11	16	S
	20	on				4	off			11	off
	45	187				7	123			19	125
13 1300-Along Cross Result										5	S
										4	off
										6	121
13 1900-Along Cross Result										11	S
										7	off
										13	128
14 0100-Along Cross Result										6	S
										3	off
										7	133
14 0700-Along Cross Result	23	N			201	12	N		48	11	N
	14	on				0				3	on
	27	309				12	340			11	325
14 1300-Along Cross Result										8	N
										3	on
										9	319
14 1900-Along Cross Result										0	
										6	off
										6	70
15 0100-Along Cross Result										5	S
										11	off
										12	94
15 0700-Along Cross Result	10	S			165	38	N		5	2	N
	0	off				29	off			1	off
	10	160				48	17			2	7
15 1300-Along Cross Result										2	S
										1	on
										2	187
15 1900-Along Cross Result										3	S
										1	off
										3	142

KEY = All speeds in cm/sec

N = Northward, Shore parallel

S = Southward, Shore parallel

on = onshore off = offshore

Table 4: Current Data (Continued)
Sep 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements				Current Meter		
	Dye at (579 m) (surface)	Distance from Baseline (m)	Dye at Mid-Surf Zone (surface)	(500m Updrift)	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	Speed	Dir
16 0100-Along Cross Result									1	S	
									2	on	
									2	223	
16 0700-Along Cross Result	29 0	N	165	0 4	on	South	10	N	7	N	
	29	340		4 250					1	on	
									7	332	
16 1300-Along Cross Result									16	N	
									4	on	
									16	326	
16 1900-Along Cross Result									11	N	
									7	on	
									13	308	
17 0100-Along Cross Result									8	N	
									5	on	
									9	308	
17 0700-Along Cross Result	29 9	N on	201	22 4	N on	South	12	N	12	N	
	30	323		22 329					7	on	
									14	310	
17 1300-Along Cross Result									19	N	
									7	on	
									20	320	
17 1900-Along Cross Result									17	N	
									3	on	
									17	330	
18 0100-Along Cross Result									7	N	
									6	on	
									9	299	
18 0700-Along Cross Result	18 9	N on	189	18 5	N on	South	20	N	8	N	
	21	313		19 323					2	on	
									8	326	
18 1300-Along Cross Result											
18 1900-Along Cross Result									11	N	
									6	on	
									13	311	
19 0100-Along Cross Result									6	N	
									4	on	
									7	306	
19 0700-Along Cross Result	18 2	N on	189	28 11	N on	no observation			3	N	
	19	334		30 318					1	on	
									3	322	
19 1300-Along Cross Result									14	N	
									5	on	
									15	320	
19 1900-Along Cross Result									3	S	
									1	on	
									3	178	
20 0100-Along Cross Result									45	S	
									15	off	
									47	142	
20 0700-Along Cross Result	76 0	S	189	152 0	S	North	61	S			
	76	160		152 160							
20 1300-Along Cross Result									41	S	
									16	off	
									44	139	
20 1900-Along Cross Result									42	S	
									15	off	
									45	140	

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Continued)
Sep 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
21 0100-Along Cross Result										30	S
										14	off
										33	135
21 0700-Along Cross Result	61	S		122	S			25	S	32	S
	0			0						15	off
	61	160		122	160					35	135
21 1300-Along Cross Result										26	S
										9	off
										28	141
21 1900-Along Cross Result										30	S
										14	off
										33	135
22 0100-Along Cross Result										18	S
										7	off
										19	139
22 0700-Along Cross Result	30	S		76	S			17	S	16	S
	0			0						10	off
	30	160		76	160					19	128
22 1300-Along Cross Result										16	S
										12	off
										20	123
22 1900-Along Cross Result										14	S
										7	off
										16	133
23 0100-Along Cross Result										3	S
										2	off
										4	126
23 0700-Along Cross Result	0			0				34	N	4	N
	2	on		0						1	off
	2	250		0						4	354
23 1300-Along Cross Result										14	N
										2	on
										14	332
23 1900-Along Cross Result										22	N
										5	on
										23	327
24 0100-Along Cross Result										8	N
										1	on
										8	333
24 0700-Along Cross Result	24	N		0				32	N	6	N
	6	off		0						1	on
	25	354		0						6	331
24 1300-Along Cross Result										13	N
										1	off
										13	344
24 1900-Along Cross Result										7	N
										1	on
										7	332
25 0100-Along Cross Result										1	N
										5	on
										5	261
25 0700-Along Cross Result	13	N		68	N			45	N	6	N
	13	on		7	on					4	on
	18	295		68	334					7	306
25 1300-Along Cross Result										7	N
										3	on
										8	317
25 1900-Along Cross Result										14	N
										3	on
										14	328

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Concluded)
Sep 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
26 0100-Along Cross Result										18	N
										2	on
										18	334
26 0700-Along Cross Result	17 0	S on		177	25 3	S on		17 S	North	9	N
	17	160			26 166					2	on
										9	327
26 1300-Along Cross Result										15	S
										7	off
										17	135
26 1900-Along Cross Result										2	S
										6	off
										6	88
27 0100-Along Cross Result										1	S
										3	off
										3	88
27 0700-Along Cross Result	38 2	S off		165	51 0	S		38 S	North	16	S
	38	157			51 160					7	off
										17	136
27 1300-Along Cross Result										28	S
										11	off
										30	139
27 1900-Along Cross Result										15	S
										7	off
										17	135
28 0100-Along Cross Result										21	S
										10	off
										23	135
28 0700-Along Cross Result	19 11	S off		160	38 46	S off		17 S	North	11	S
	22	129			60 110					7	off
										13	128
28 1300-Along Cross Result										14	S
										9	off
										17	127
28 1900-Along Cross Result										9	S
										5	off
										10	131
29 0100-Along Cross Result										10	S
										7	off
										12	125
29 0700-Along Cross Result	8 0	N on		177	18 0	N		10 N	South	3	S
	8	340			18 340					5	off
										6	101
29 1300-Along Cross Result										6	S
										6	off
										8	115
29 1900-Along Cross Result										8	N
										1	off
										8	347
30 0100-Along Cross Result										4	N
										0	
										4	340
30 0700-Along Cross Result	0			165	7 3	N off		37 N	South	8	N
	0				8 7					1	on
	0	0								8	333
30 1300-Along Cross Result										7	S
										5	off
										9	124
30 1900-Along Cross Result										17	S
										6	off
										18	141

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A jar along with a thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The jar is removed, the temperature read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the surface visibility.

Table 5: Supplemental Observations

Sep 1991

Day	Time	Wave Approach		Radar Wave Angle deg from True N	Width of Surf Zone.m	Water Characteristics at Pier End		
		Primary	Secondary			Temp.,C	Density g/cc	Secchi Vis.,m
1	0720	50	20	50	187	23.9	1.0218	1.2
2	0830	65	30	60	195	23.3	1.0208	0.9
3	0750	90	30	80	108	24.4	1.0204	0.6
4	0830	110			126	25.0	1.0204	3.4
5	0830	100			148	25.0	1.0210	1.2
6	0730	110			12	25.6	1.0210	1.2
7	0805	80	40	90	18	25.6	1.0202	1.5
8	1000	80	40	80	30	25.0	1.0204	2.7
9	0900	100		80	140	25.0	1.0206	1.5
10	0810	105			21	25.6	1.0202	4.9
11	0815	110			5	24.4	1.0214	1.5
12	0830	80	40		7	25.6	1.0207	3.0
13	0720	45			34	26.1	1.0202	4.0
14	0800	140			38	26.7	1.0201	4.3
15	0700	85			142	25.6	1.0202	4.0
16	0645	90	65		30	26.3	1.0204	3.0
17	0720	110			15	23.9	1.0222	1.5
18	0930	110			15	23.9	1.0222	1.2
19	0805	110			20	23.9	1.0227	1.5
20	0930	35	15	55	179	21.7	1.0233	1.2
21	1015	45	10	60	154	21.1	1.0222	0.6
22	1015	65	10	65	110	22.2	1.0203	0.9
23	0645	100	40		17	22.8	1.0200	1.5
24	1200	90		80	134	22.8	1.0204	2.1
25	0849	110	150		132	22.2	1.0220	2.1
26	0811	100	10	80	6	22.2	1.0222	1.5
27	0814	25			63	21.7	1.0226	0.9
28	0900	40	5	75	93	20.0	1.0224	
29	1400	90	140		96	22.8	1.0216	1.5
30	0726	90	5		29	22.2	1.0221	2.1

PART VI: WATER LEVELS

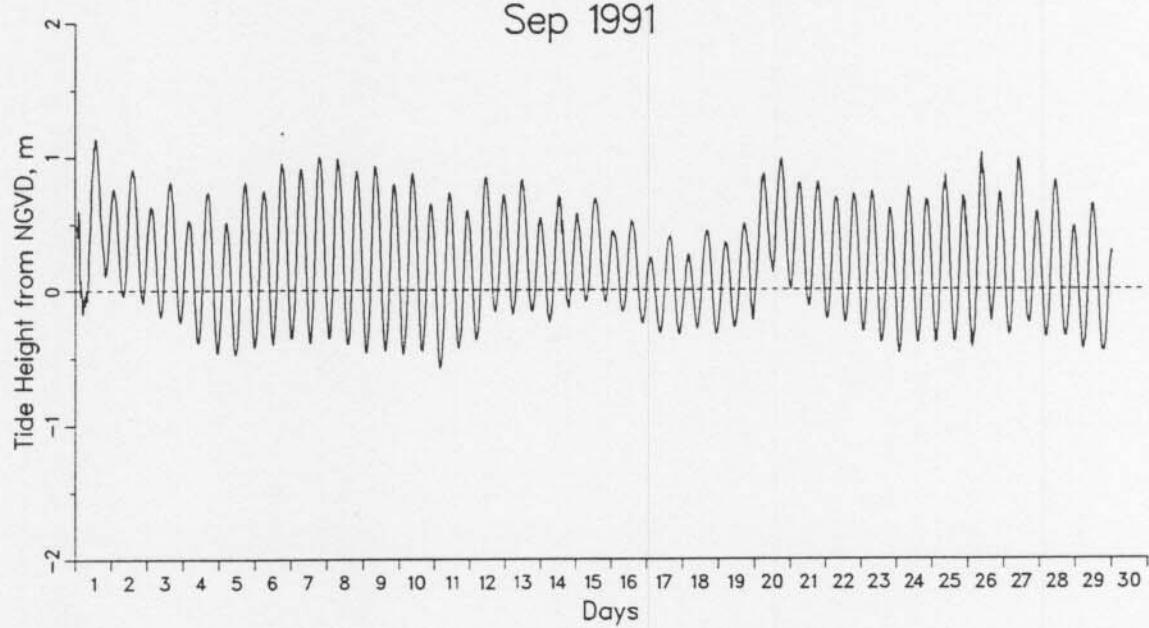
Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Sep 1991



Monthly Water Levels, m NGVD

Extreme Low = -0.58 on day 11 at 242 EST
Extreme High = 1.14 on day 1 at 1224 EST
Monthly Mean = 0.21
Mean Low = -0.29
Mean High = 0.78
Mean Range = 1.07

Table 6: Water Levels.m NGVD

		Sep 1991			
Day	Mid-Cycle Time	Low	High	Mean	Range
1	624	-0.18	1.14	0.34	1.31
1	1849	0.11	1.13	0.55	1.02
2	714	-0.04	0.89	0.39	0.94
2	1939	-0.09	0.91	0.36	1.00
3	804	-0.20	0.80	0.27	1.00
3	2030	-0.23	0.81	0.23	1.05
4	855	-0.39	0.70	0.12	1.09
4	2120	-0.46	0.74	0.10	1.20
5	945	-0.47	0.76	0.07	1.23
5	2210	-0.43	0.81	0.19	1.24
6	1036	-0.40	0.88	0.23	1.28
6	2301	-0.36	0.95	0.29	1.31
7	1126	-0.39	0.91	0.29	1.30
7	2351	-0.36	1.00	0.33	1.36
8	1216	-0.40	0.98	0.28	1.39
9	42	-0.46	0.90	0.23	1.36
9	1307	-0.45	0.93	0.23	1.38
10	132	-0.47	0.84	0.18	1.31
10	1357	-0.45	0.88	0.18	1.33
11	222	-0.58	0.69	0.05	1.27
11	1448	-0.43	0.73	0.13	1.16
12	313	-0.37	0.80	0.15	1.17
12	1538	-0.16	0.85	0.31	1.01
13	403	-0.18	0.81	0.28	0.99
13	1628	-0.16	0.83	0.27	0.99
14	454	-0.24	0.68	0.17	0.92
14	1719	-0.13	0.71	0.26	0.84
15	544	-0.09	0.68	0.26	0.77
15	1809	-0.09	0.69	0.27	0.77
16	634	-0.16	0.48	0.15	0.65
16	1859	-0.24	0.53	0.10	0.77
17	725	-0.32	0.37	-0.01	0.69
17	1950	-0.33	0.41	0.02	0.73
18	815	-0.29	0.38	0.03	0.66
18	2040	-0.33	0.45	0.05	0.77
19	905	-0.28	0.42	0.07	0.70
19	2131	-0.22	0.73	0.23	0.94
20	956	0.12	0.87	0.54	0.75
20	2221	0.00	0.99	0.47	0.98
21	1046	-0.12	0.80	0.34	0.93
21	2311	-0.22	0.81	0.28	1.03
22	1137	-0.24	0.72	0.24	0.96
23	2	-0.31	0.72	0.22	1.03
23	1227	-0.39	0.74	0.16	1.14
24	52	-0.47	0.74	0.11	1.21
24	1317	-0.39	0.77	0.18	1.16
25	143	-0.39	0.81	0.20	1.21
25	1408	-0.39	0.86	0.20	1.25
26	233	-0.43	1.02	0.21	1.45
26	1458	-0.23	0.92	0.32	1.16
27	323	-0.34	0.98	0.24	1.32
27	1549	-0.24	0.95	0.26	1.19
28	414	-0.36	0.82	0.18	1.17
28	1639	-0.34	0.79	0.13	1.14
29	504	-0.44	0.64	0.05	1.08
29	1729	-0.46	0.62	-0.02	1.07
30	555				
30	1820				

PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Geodimeter surveying system; a Geodimeter 140-T self-tracking, electronic theodolite, distance meter, in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in August and the two surveys in September on profile line 188, located 517 m south of the pier. The only significant changes to the profile followed a small storm on 20 September. This storm created an unusual double bar in the nearshore (170 - 280 m) as well as an area of deposition at the toe of the foreshore (150 - 170 m). Only minor changes are visible on the remainder of the profile.

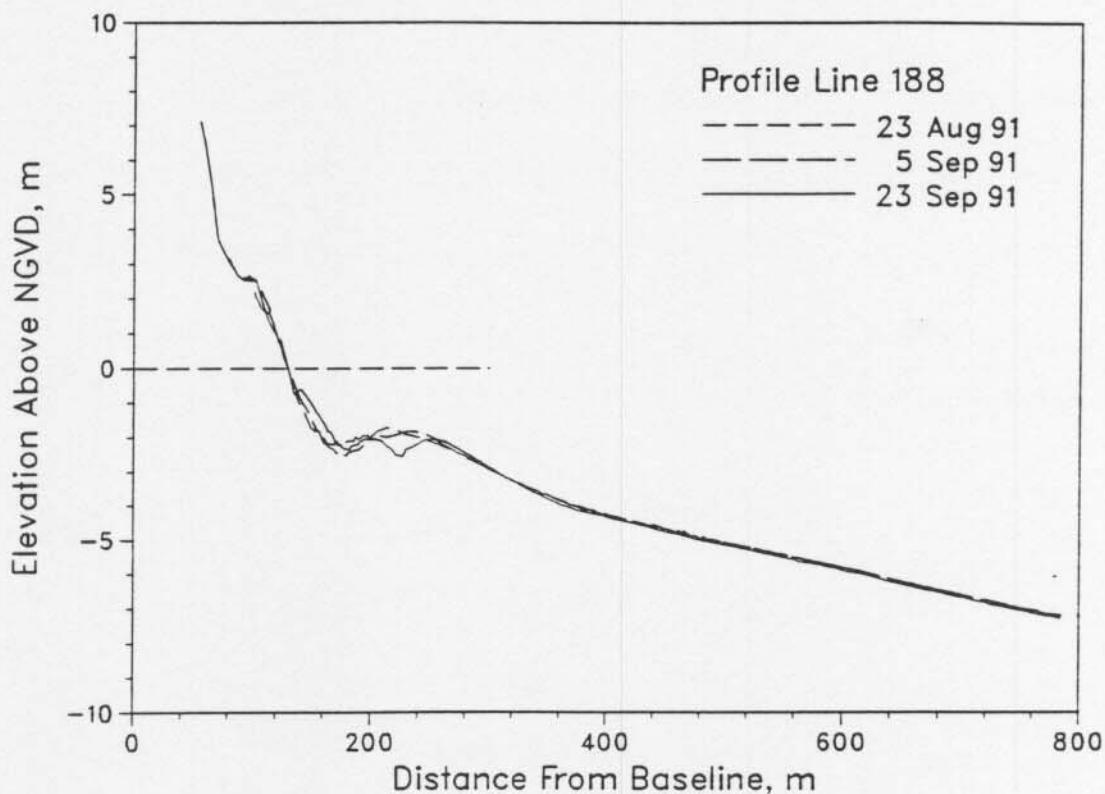


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1991. The deposition at the toe of the foreshore (150 - 170 m) is responsible for the only change to the envelope.

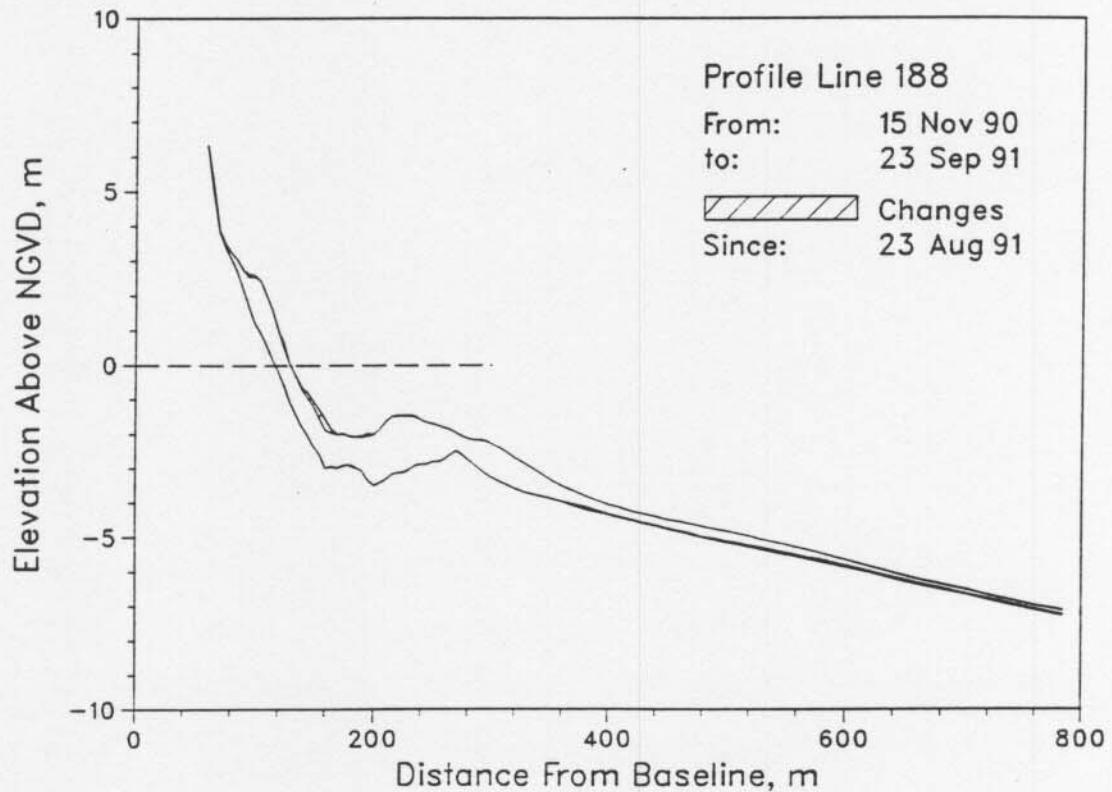


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey on 6 September. Wide contour lines on the change diagram represent eroded areas; thin lines indicate deposition.

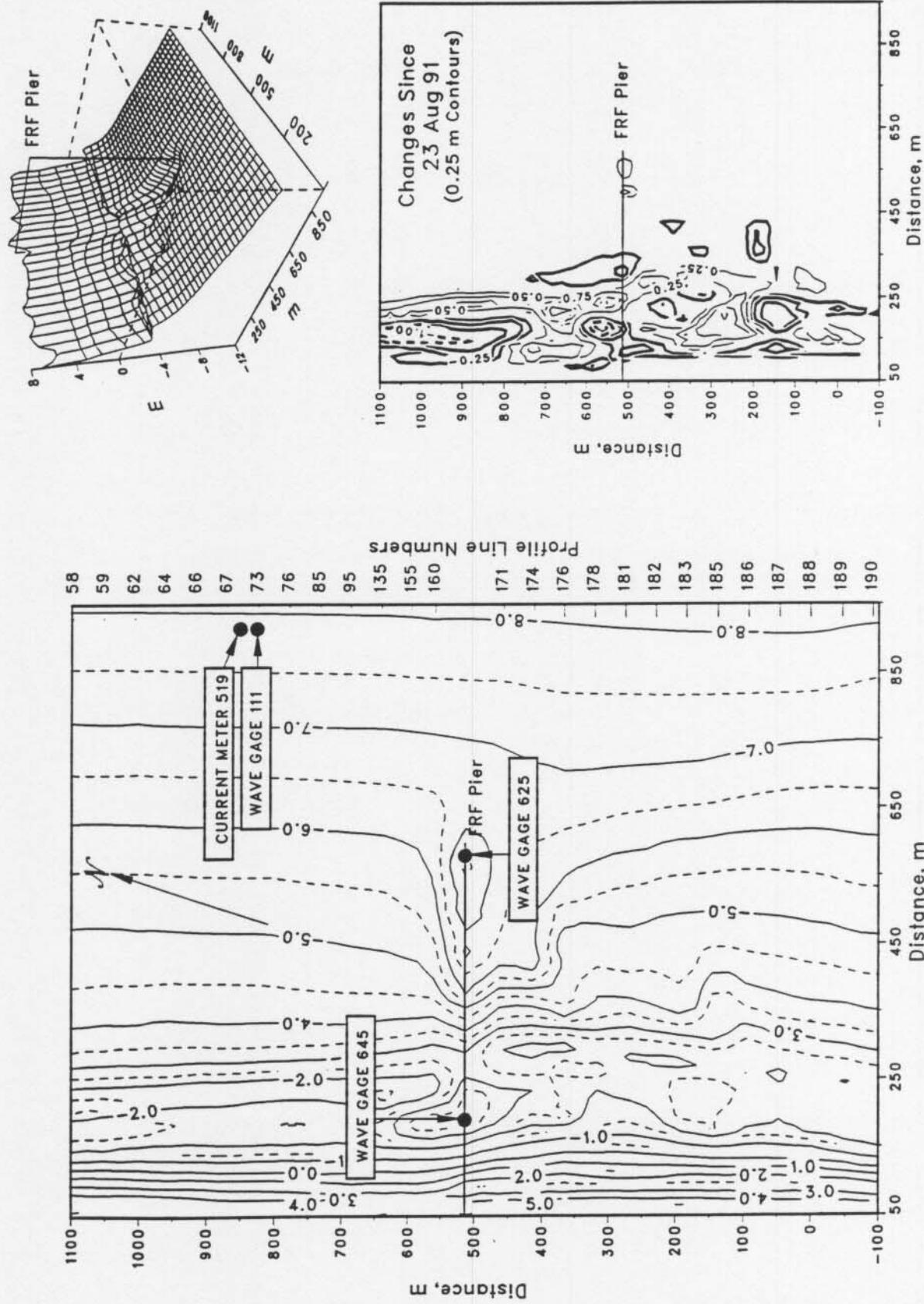


Figure 7 FRF bathymetry 23 Sep 91 depths relative to NGVD

PART VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the significant wave height at the seaward end of the pier (i.e. as measured near the end of the pier) exceeded 2 m and four contiguous 34 minute wave records were obtained every three hours:

<u>Start</u>	<u>End</u>
1 Sep (1034)	2 Sep (0316)
20 Sep (0242)	20 Sep (1516)

B. Storm Synopsis.

1-2 September - A strong Canadian high pressure system generated storm waves at the FRF on 1-2 September. Maximum winds (from northeast) approached 15 m/s peaking at 1300 EST on 1 September with the maximum H_{mo} (at gage 625) of 2.47 m ($T_p = 8.00$ sec) occurring several hours later at 1742 EST.

20 September - A mid-Western high pressure system briefly produced storm waves at the FRF on 20 September. Maximum winds (from northwest) exceeding 16 m/s were recorded at 1000 EST on 20 September with the maximum H_{mo} (at gage 625) of 2.28 m ($T_p = 7.11$ sec) occurring at 1216 EST.

Distribution List

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OCE	U.S. Geological Survey
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NOAA (NOS, NWS)	U.S. Naval Fac. Eng. Com.
SAD	U.S. Naval Oceanographic Off.
SAW	U.S. Naval Research Lab

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